

The centipede genera *Alluopus* Silvestri, 1911 and *Rhysida* Wood, 1862 (Scolopendromorpha, Scolopendridae) in Vietnam, with a description of a new species

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Abstract

Two centipede genera, *Alluopus* Silvestri, 1912, and *Rhysida* Wood, 1862, were examined within the context of Vietnam's fauna. According to literature and 316 recently collected specimens, four species have been documented, including a new species, *Rhysida vietnga* **sp. nov.** Their distribution is updated, and an identification key to the Vietnamese species is also provided.

Key Words

Biodiversity, morphology, new species, Southeast Asia, taxonomy

Introduction

Centipedes of the order Scolopendromorpha are morphologically diverse predators in tropical ecosystems. Taxonomic studies on this group in Southeast Asia have grown in recent decades but remain limited in scope and geographic coverage. Species boundaries are often obscured by significant morphological variation, sexual dimorphism, and cryptic diversity (Siriwut et al. 2015, 2018).

Within the order Scolopendromorpha, the genera *Alluopus* and *Rhysida* are classified into the subfamily Otostigminae of the family Scolopendridae. Despite their ecological significance, species delimitation within the group remains problematic due to morphological variability and overlapping diagnostic characters. The main characteristics to distinguish them from other genera are the presence of eyes and spiracles on the 7th body segment (Siriwut et al. 2018; Schileyko et al. 2020). To date, 36 species of the genus *Rhysida* have been documented

globally, primarily in tropical regions of Asia and America (Bonato et al. 2016; Siriwut et al. 2018), with just eight species found in Southeast Asia. *Alluopus* is monotypic and has been recorded only in the mainland of Southeast Asia (Vietnam, Laos, Cambodia, Thailand, and the Malay Peninsula) (Siriwut et al. 2018).

In Vietnam, three species from these genera are currently recognized as valid: *Alluopus calcaratus* (Pocock, 1891), *Rhysida immarginata* (Porat, 1876), and *Rhysida longipes* (Newport, 1845). Previously, five species were reported from the country, namely *Alluopus demangei* Silvestri, 1912; *Rhysida nuda* (Newport, 1845); *R. longipes* (Newport, 1845); *R. calcarata* Pocock, 1891; and *R. marginata* Attems, 1953 (Schileyko 2007; Tran et al. 2013).

Subsequent taxonomic revision by Siriwut et al. (2018) clarified that *Alluopus demangei* and *R. marginata* are junior synonyms of *Alluopus calcaratus* (Pocock, 1891). Although *R. calcarata* was previously

considered a separate species, it was transferred to the genus *Alluopus* and is now treated as a new combination (*Alluopus calcaratus*) rather than a true synonym. Regarding *Rhysida nuda*, Siriwt et al. (2018) noted that extra-Australian records of this species were misidentified and should be attributed to *Rhysida immarginata* (Porat, 1876). Nevertheless, *R. nuda* remains a valid species endemic to Australia. Thus, the synonymy applies only to misapplied names outside its native range, and the classification of Vietnamese specimens requires further verification.

Based on recently collected specimens, this work aims to update the morphological diversity and distribution of *Alluopus* and *Rhysida* present in Vietnam, including a still unknown species of this latter genus. In addition, an identification key is compiled to promote further taxonomic study of centipedes in Vietnam.

Materials and methods

A total of 316 specimens were collected from 16 locations in Vietnam (Fig. 1). Collected specimens were preserved in 80–90% ethanol and housed in the Joint Vietnam-Russia Tropical Science and Technology Research Center, Vietnam (VRTC), and in the Institute of Biology, Hanoi, Vietnam (IB). Alive specimens and habitat photos were taken using a Canon EOS 7D digital camera. Preserved specimens were examined and measured under an Olympus SZ61 microscope. A series of photos were taken using the Olympus SC180 camera and then stacked using the software Helicon Focus 7.0.

The terminology for the external morphology of centipedes follows Bonato et al. (2010). Taxonomic nomenclature and species identification followed Kraepelin (1903), Attems (1930, 1938), Lewis (2001), Schileyko

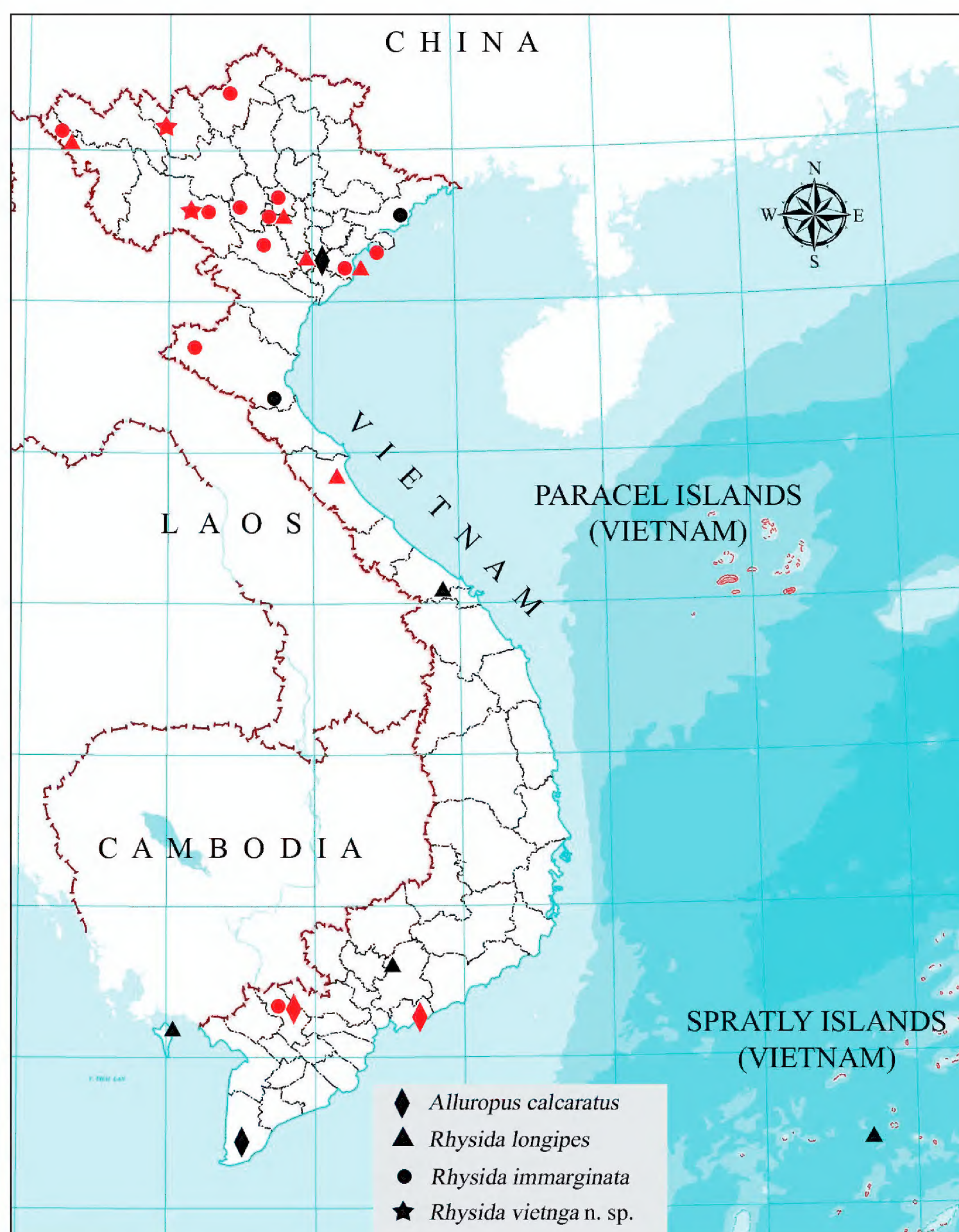


Figure 1. Distribution of species in Vietnam. Red symbols refer to new records; black symbols refer to previous records.

(1992, 1995, 2007), Schileyko et al. (2020), and Siriwtut et al. (2018). The holotype and paratypes are deposited in the Centipedes collection, VRTC.

Abbreviations

LBS	leg-bearing segment(s);
VL	ventrolateral spine(s);
VM	ventromedian spine(s);
M	median spine(s);
DM	dorsomedian spine(s);
CS	corner spine(s);
NP	National Park;
NR	Natural Reserve;
spm(s)	specimen(s);
a.s.l.	above sea level;
col.	collector;
m	meter(s).

Results

Taxonomy

Order Scolopendromorpha Leach, 1814

Family Scolopendridae Leach

Subfamily Otostigminae Kraepelin, 1903

Genus *Alluopus* Silvestri, 1912

Type species. *Alluopus demangei* Silvestri, 1911, by monotypy.

Diagnosis. According to Schileyko et al. (2020: p.50), the genus can be recognized by the following characters: median tooth of labrum well developed; forcipular tooth-plates present; trochantero-prefemur with well-developed process; tergites never with longitudinal keels; sternites with incomplete paramedian sutures (in some species much shortened, sometimes also with median and lateral depressions of various sizes/shapes; LBS 7 with spiracles; legs with tarsal spur(s), legs 1 with prefemoral spur; coxopleural process ranging from short to very long and much enlarged with spines (at least with apical ones); prefemur of the ultimate leg with spines; ultimate pretarsus well-developed, with accessory spines.

Distribution. Vietnam, Cambodia, Laos, and Thailand.

Alluopus calcaratus (Pocock, 1891)

Figs 1, 2, 3

Rhysida calcarata Pocock, 1891: 61; Kraepelin 1903: 146; Attems 1930: 191; Attems 1938: 338; Schileyko 2007: 83, fig. 6; Siriwtut et al. 2018: 1029, figs 14–23.

Alluopus demangei Silvestri, 1912; Attems 1930: 198; Schileyko 2007: 92; Tran et al. 2013: 221;

Rhysida marginata Schileyko, 2007: 92; 148; Tran et al. 2013: 227;

Alluopus calcaratus Siriwtut et al. 2018: 1029; Schileyko et al. 2020: 50.

Examined materials. VIETNAM • 3 specimens; Ba Ria–Vung Tau Province, residential area; 10.62583°N, 107.44694°E; 47 m a.s.l.; 25 Oct. 2016; A.D. Nguyen leg.; IEBR.VT.2016.1, IEBR.VT.2016.2, IEBR.VT.2016.3. • 1 specimen; Dong Thap Province, Tram Chim NP, *Melaleuca* forests; 10.71746°N, 105.52186°E; 47 m a.s.l.; 25 Oct. 2016; D.H. Dang leg.; SVR.TrC.010.

Diagnosis. Body with 21 LBS, and LBS 7th with spiracles (Fig. 2E). Antennae (Fig. 2A, B) composed of 20–21 articles, of which three basal ones glabrous dorsally. Cephalic plate smooth, lateral and posterior marginations absent; the posterior edge straight, and covered by tergite 1 (Fig. 2A). Forcipular trochanteroprefemur with median tooth; tooth-plates with 4+4 teeth clearly, sharply (Fig. 2B). Tergite 1 wider than the cephalic plate and twice as long as tergite 2 (Fig. 2A); tergites 3–19(20) with complete paramedian sutures, and tergites 12(13)–20 with lateral marginations incomplete or nearly complete (Figs 2E, 3A, B). Sternites 3–20 with complete paramedian sutures (Fig. 2C, D). Coxopleuron with 1 apical, 2 subapical, and 1 lateral spine, without dorsal spine (Fig. 3D). Leg 1 with prefemoral and femoral spurs (Fig. 2B). Ultimate legs (Fig. 3C, D) long and slender, with ratio between the length and width of prefemur 4.5:1; prefemoral spines on ultimate leg: 4 VL, 2–3 VM, 3–4 M, and 1–2 DM spines.

Remarks. Compared to Kraepelin (1903), Attems (1930), and Siriwtut et al. (2018), our specimens have slight differences, e.g., shorter body length (maximum 32 mm vs. 57 mm in Kraepelin (1903) and 52 mm in Siriwtut et al. (2018)). This is probably due to the low number of specimens collected and probably not an actual difference. The lateral marginations start from tergite 9 (or 11) in descriptions of Attems (1930) and Kraepelin (1903), but these start from tergite 12 (or 13) in our specimens and the description of Siriwtut et al. (2018).

Our specimens do not agree with the description of Siriwtut et al. (2018) in the ratio between tarsus 1 and tarsus 2 (1.6:1 vs. 0.3:1) but more or less similar to Schileyko (2007) (terminal tarsus 1 more than twice longer than tarsus 2).

Distribution. This species has only been recorded in Southeast Asia, including Thailand, Laos, Cambodia, and Vietnam (Tran et al. 2013; Siriwtut et al. 2018). In Vietnam it was recorded from Ha Nam Province (Phu Ly) and Ca Mau Province (Attems 1930; Tran et al. 2013), and Ba Ria–Vung Tau Province and Dong Thap Province in this study. The distribution of *A. calcaratus* was further updated (Fig. 1).

Genus *Rhysida* Wood, 1862

Type species. *Rhysida lithobioides* (Newport, 1845).

Diagnosis. Body with 21 LBS. LBS 7th with spiracles. Antennae composed of 16–21 articles, of which 2.8–3 basal ones glabrous dorsally. Cephalic plate without lateral and posterior marginations. Forcipular tooth-plates present; tooth-plates with 4–7 teeth; trochantero-prefemur with well-developed process; coxosternite with short median suture starting from tooth-plate. Sternites with incomplete paramedian sutures. Coxopleural process long with 1–2 apical,

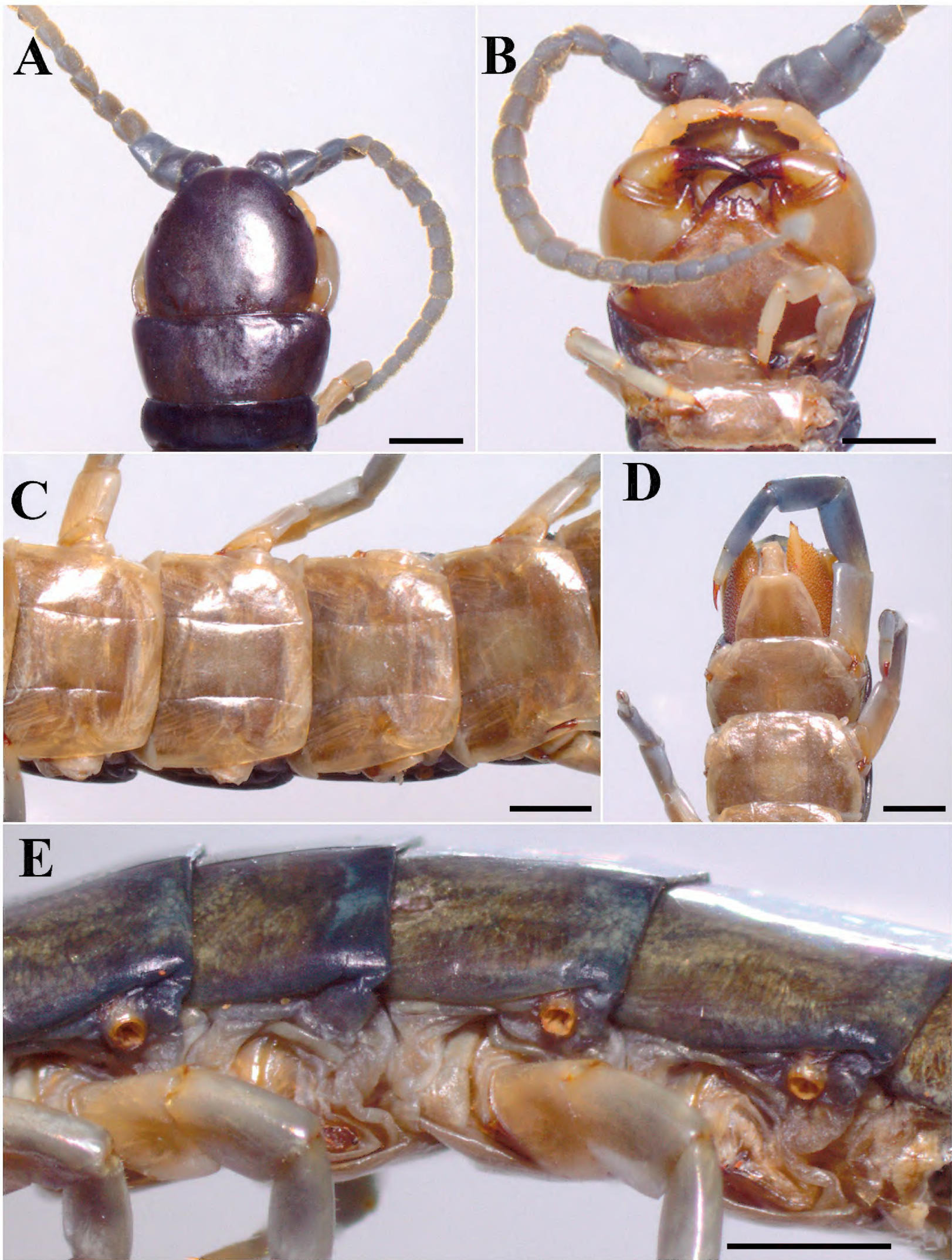


Figure 2. *Alluopus calcaratus* (Pocock, 1891); IEBR.VT.2016.1. **A.** Cephalic plate and LBS; **B.** Head and forcipular segment, ventrally; **C.** Sternites 6–9; **D.** Last sternites and coxopleuron; **E.** LBS 5–8, laterally. Scale bars: 1 mm.

0–2 subapical, and 0–1 lateral spines, without dorsal spines.
Leg 1 with 1 femoral, 1 tibial, and 2 tarsal spurs.

Distribution. Neotropics, Africa and Indomalaya, and Australia.

***Rhysida longipes* (Newport, 1845)**

Figs 1, 4, 5

Rhysida longipes Kraepelin 1903: 148, fig. 91; Attems 1930: 193; Schi-
leyko 2007: 82; Tran et al. 2013: 227; Schi-leyko and Stoev 2016:

257, figs 18, 22–24; Siri-
wut et al. 2018: 1017, figs 5B, 6–8; Joshi et al. 2019: 835, figs 8.

Branchiostoma affine Kohlrausch, 1878: 67; Kraepelin 1903: 148.
Otostigmus simplex Attems, 1930: 153; Lewis 2002: 1690, figs 8–11.

Examined materials. VIETNAM • 1 specimen; Dien Bien Province, Muong Nhe NR, residential area; 21.21278°N, 103.39833°E; 610 m a.s.l., May 2018; H.D. Nguyen leg.; DB020; • 23 specimens; Thai Binh Province, Tien Hai NR, coniferous forest; 20.25306°N, 106.59306°E; 08 m a.s.l.; 2021; H.D. Nguyen leg.; HNUE CHI 1068 to 1070,

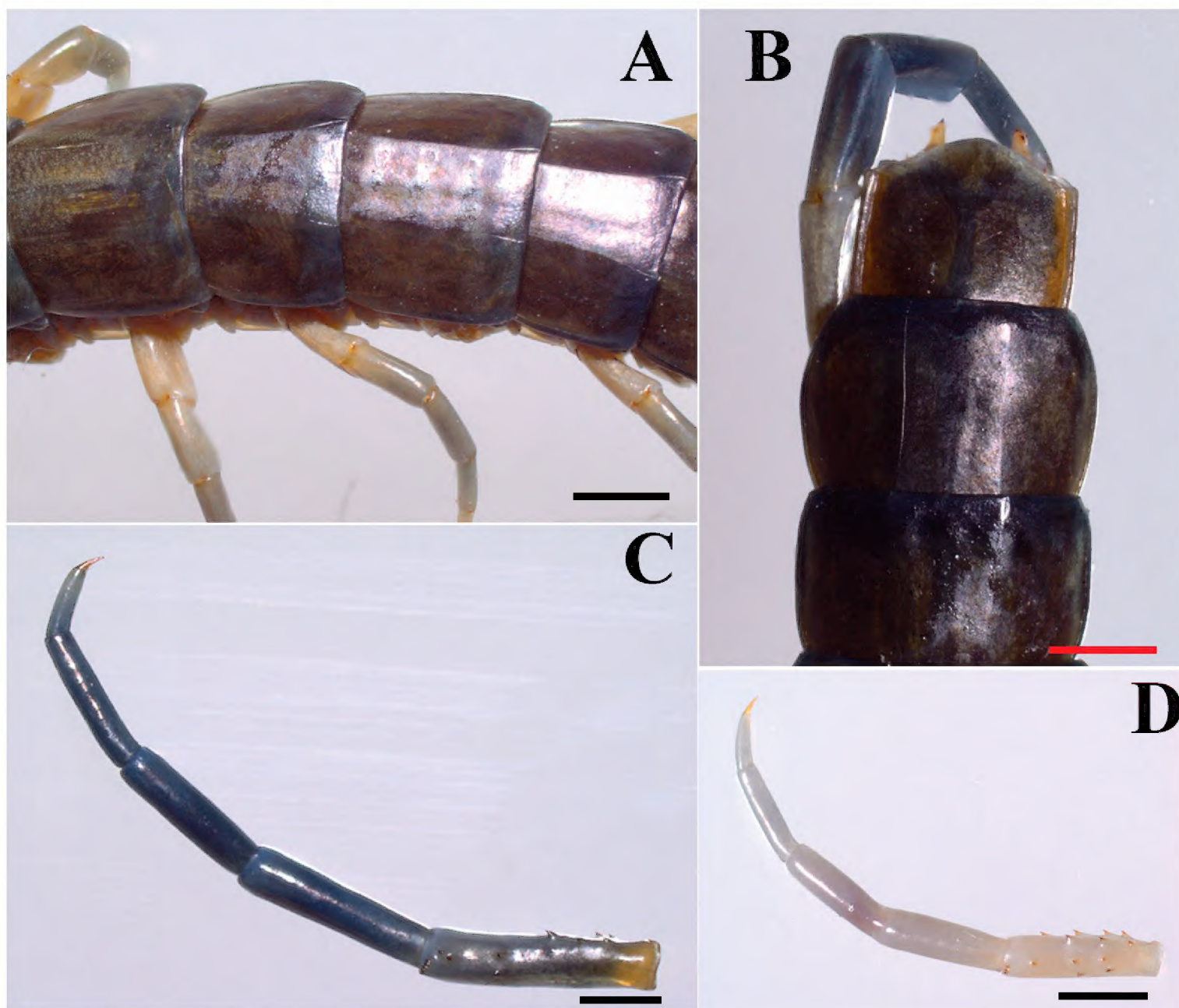


Figure 3. *Alluopus calcaratus* (Pocock, 1891), IEBR.VT.2016.1. **A.** Tergites 8–11; **B.** Tergite of ultimate leg-bearing segment; **C, D.** Ultimate leg, ventrally, sample IEBR.VT.2016.1 (**C**), sample VRTC.TrC.010 (**D**). Scale bars: 1 mm.

1072, 1073, 1075 to 1080, 1082, 1083, 1085, 1087, 1088, 1090, 1091, 1095, 1096, 1099, 1101, 1103; • 1 specimen; Ha Nam Province, agricultural land; 20.59323°N, 105.97150°E; 6 m a.s.l.; 2017; H.T.T. Nguyen leg.; Hna.001; • 1 specimen; Hanoi, Ba Vi NP, natural forest; 21.08346°N, 105.35920°E; 460 m a.s.l.; Aug. 2016; S.X. Le leg.; BV.SL.013; • 7 specimens; Hanoi, agricultural land • 3 specimens; Hanoi, Cau Giay district; 21.04000°N, 105.13389°E; 13 m a.s.l.; 2017; H.D. Nguyen & B.T.T. Tran leg.; HN001, HN101, HN102; • 2 specimens; Hanoi, Tay Ho district; 21.06906°N, 105.79577°E; 15 m a.s.l.; May 2023; D.X. Le leg.; VRTC.HN022, VRTC.HN023 • 1 specimen; Hanoi, Long Bien district, 21.05233°N, 105.88749°E; 10 m a.s.l.; 20 Aug. 2023; S.X. Le leg.; VRTC.HN.025; • 5 specimens; QUANG BINH Province, coniferous forest; S.X. Le leg.; 11 May 2022: VRTC.BTr.001 and VRTC.BTr.003: 17.49535°N, 106.62392°E, 5 m a.s.l.; VRTC.BTr.002: 17.49481°N, 106.62323°E, 5 m a.s.l.; VRTC.BTr.004: 17.49823°N, 106.62072°E, 10 m a.s.l.; VRTC.BTr.005: 17.49949°N, 106.62004°E, 8 m a.s.l.; • 3 specimens collected by S.X. Le in residential area on 11 May 2022: VRTC.BTr.006: 17.49769°N, 106.61829°E; 8 m a.s.l.; VRTC.BTr.007 and VRTC.BTr.008: 17.49795°N, 106.61936°E, 6 m a.s.l.; • 202 specimens; Khanh Hoa Province, Truong Sa islands; residential area, 6.50000–12.00000°N, 111.50000–117.33333°E; below 15 m a.s.l.; 2020 and 2021; S.X. Le, T.N. Nguyen, D.T. Dinh and H.B. Truong leg.; KCB.TS.04.001 to 003, 011, 016, 019, 021 to 023, 033, 040, 046, 102, 103, 201,

203 to 204, 206 to 209, 214 to 215, 217, 219 to 229, 301 to 303, 305 to 307, 310, 402 to 411, 414 to 421, 423 to 425, 427 to 431, 501, 506, 511 to 512, 515 to 518, 520, 526 to 527, 529, 531 to 534, 536 to 537, 539 to 544, 601 to 618, 620 to 621, 623 to 632, 701, 702 to 721, 723 to 726, 728 to 740, 745 to 746, 801 to 804, 807 to 819, 821 to 830, 832, 837, 840 to 842, 844 to 846, 901 to 904, 906, 908.

Diagnosis. Body with 21 LBS. LBS 7th with spiracles. Antennae (Fig. 4A, B) composed of 18 articles, of which three basal ones glabrous dorsally. Cephalic plate (Fig. 4A) without lateral and posterior marginations; posterior edge straight and covered by tergite 1. Forcipular segment (Fig. 4B) smooth; tooth plates with 4+4 teeth obviously; coxosternite with short median suture starting from toothplate. Tergites without short median sulcus; paramedian sutures complete on tergites 4(5)–19 (Figs 4C, 5A); lateral marginations incomplete on tergites 6(10)–20 and complete on tergite 21 (Figs 4C, 5A). Sternites 3–20 with incomplete (10–15% length of sternites) paramedian sutures (Figs 4B–D, 5B). Coxopleural process long with 2 apical, 1 subapical, and 1 lateral spine, without dorsal spine (Fig. 5B). Leg 1 present or absent femoral spur (Fig. 4A, B). Prefemoral spines on ultimate legs with 2–3 VL, 2–5 VM, 0–1 M, and 1–3 DM spines; prefemoral process of ultimate legs very short with 1 spine (Fig. 5C).

Remarks. Our examined specimens have similar morphological characteristics to those described by Siriwtut et al. (2018) and Joshi et al. (2019). There is a small difference in the starting of lateral marginations and paramedian

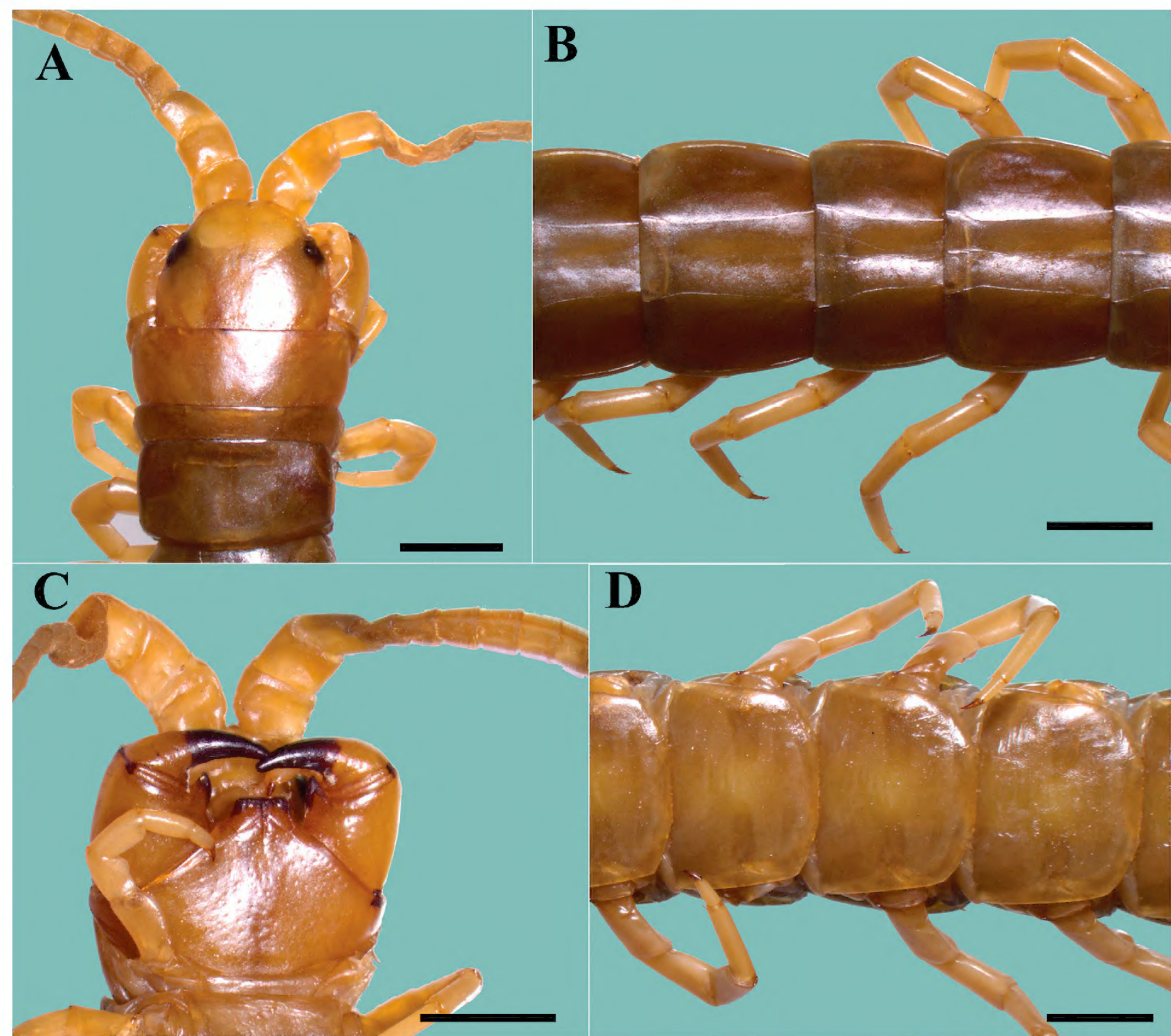


Figure 4. *Rhysida longipes* (Newport, 1845), HNUE 1104. **A.** Cephalic plate and LBS; **B.** Head and forcipular segment, ventrally; **C.** Tergites 6–10; **D.** Sternites 7–11. Scale bars: 2 mm.

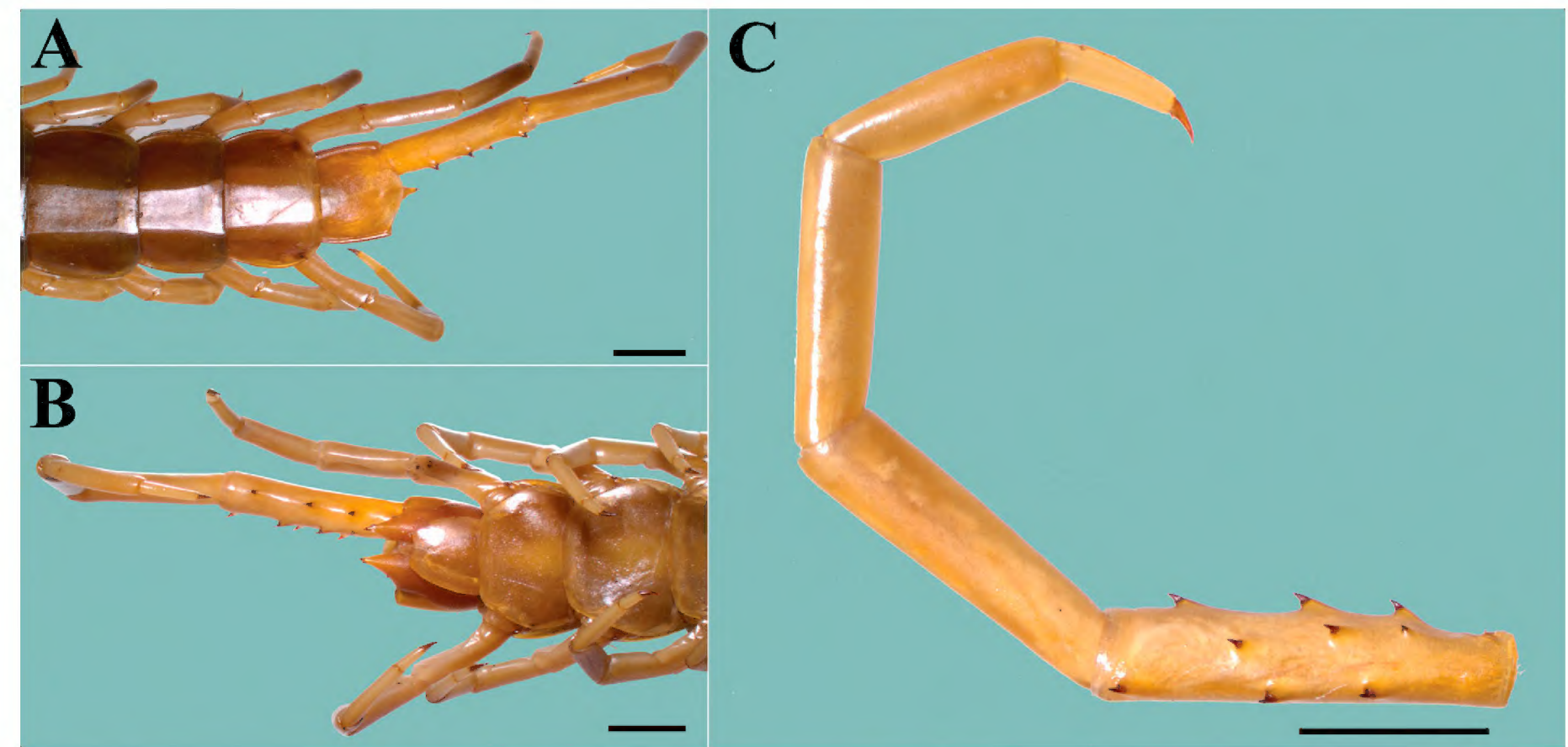


Figure 5. *Rhysida longipes* (Newport, 1845), HNUE 1104. **A.** Tergite of ultimate leg-bearing segment; **B.** Last sternites and coxopleuron, ventrally; **C.** Ultimate leg, ventrally. Scale bars: 2 mm.

sutures. Our specimens showed the lateral marginations start from tergite 4(5) and paramedian sutures start from 6(8), but these start from tergites 5–8 and tergites 8–11, respectively, in Siriwt et al. (2018), and tergites 7–8 and tergites 4–7, respectively, in Joshi et al. (2019).

Distribution. This species is widespread in tropical mainland and island regions. It occurs in Africa (Madagascar, Seychelles, and Mauritius), Central and South America (Mexico, Peru, Cuba, and Haiti), and Central, East, and Southeast Asia (China, Taiwan, Nepal, India, Sri Lanka, Chagos Islands, Yemen, Pakistan, Iran, Myanmar, Thailand, Cambodia, Malay Peninsula, Philippines, and Papua New Guinea) (Siriwt et al. 2018; Joshi et al. 2019).

In Vietnam, it has been recorded from Thua Thien Hue (Hai Van Pass); Dong Nai (Ma Da); Khanh Hoa (Spratly Islands); and Kien Giang (Phu Quoc Island) (Attems, 1938; Schileyko, 2007; Son et al. 2022); and in Dien Bien, Thai Binh, Hanoi, Ha Nam, and Quang Binh (in this study). The distribution of *R. longipes* was further updated (Fig. 1).

Rhysida immarginata (Porat, 1876)

Figs 1, 6, 7

Rhysida immarginata Pocock, 1891 - Kraepelin 1903: 143; Lewis 2001: 45; Siriwt et al. 2018: 1022, figs 9–11.

Rhysida nuda immarginata Attems, 1930: 190.

Rhysida nuda Attems, 1930: 189, figs 236–237; Attems 1938: 337; Tran et al. 2013: 227.

Examined materials. VIETNAM • 1 specimen; Ha Giang Province, Tay Con Linh NR, natural forest; 22.78121°N, 104.85867°E; 1,113 m a.s.l.; 2019; col. A.D. Nguyen leg.; HG.TCL.02. • 3 specimens; Dien Bien Province, Muong Nhe Natural Reserve; residential area, 21.21278°N, 103.39833°E; 610 m a.s.l.; May 2018; S.X. Le & H.D. Nguyen leg.; DB019, DB013, DB018; • 2 specimens; same location, residential area; 22.30056°N, 102.39833°E; 558 m a.s.l.; Nov. 2017; S.X. Le leg.; MN018.1, MN106. • 1 specimen; Son La Province, Ta Xua NR, residential area, 21.35972°N, 104.66972°E; 673 m a.s.l.; 11 Oct. 2017; S.X. Le and H.T. Vu leg.; HNUe.TX. D4.001 • 1 specimen; same location, bamboo forest; 21.33833°N, 104.69139°E; 429 m a.s.l.; 14 Oct. 2017; L.K. Ha leg.; HNUe.TX.142. • 2 specimens; Hoa Binh Province, Thuong Tien NR, residential area; 20.66127°N, 105.46142°E; 175 m a.s.l.; Jul. 2020; H.D. Nguyen leg.; HNUe.TT.202 to 203. • 4 specimens; Phu Tho Province, Xuan Son NP, natural forest; 21.11426°N, 104.95845°E; 511 m a.s.l.; 13 Jun. 2014; S.X. Le leg.; VRTC.XS.015 to 016, VRTC.XS.018 to 019 • 4 specimens; same location, natural forest; 21.118219°N, 104.95159°E; 492 m a.s.l.; 10 Jun. 2014; S.X. Le leg.; VRTC.XS.006, VRTC.XS.009 to 010, VRTC.XS.021 • 4 specimens; same location, mixed wood–bamboo; 21.136413°N, 104.95244°E; 524 m a.s.l.; 12 Jun. 2014; S.X. Le leg.; VRTC.XS.011 to 014 • 1 specimen; Xuan

Son NP, natural forest; 21.12622°N, 104.92145°E; 556 m a.s.l.; 14 Jun. 2014; S.X. Le leg.; VRTC.XS.025. • 1 specimen; Vinh Phuc Province, Tam Dao NP, residential area; 21.45627°N, 105.64222°E; 1,001 m a.s.l.; Oct. 2022; A.D. Nguyen leg.; IEBR.VP.132. • 1 specimen; Hai Phong city, Duong Kinh, residential area; 20.82540°N, 106.68219°E; 5 m a.s.l.; 16 May 2021; S.X. Le leg.; VRTC.HP.01. • 8 specimens; Thai Binh Province, Tien Hai NR, coniferous forest; 20.25306°N, 106.59306°E; 8 m a.s.l.; 2021; H.D. Nguyen leg.; HNUe CHI 1066 to 1067, HNUe CHI 1081, HNUe CHI 1088, HNUe CHI 1092, HNUe CHI 1096, HNUe CHI 1098, HNUe CHI 1100. • 1 specimen; Ha Noi city, Ba Vi NP, natural forest; 21.08191°N, 105.35786°E; 487 m a.s.l.; Aug. 2016; S.X. Le leg.; VRTC.BV.104 • 5 specimens; same location, residential area; 21.04000°N, 105.13389°E; 13 m a.s.l.; 8 Jan. 2019; H.D. Nguyen leg.; VRTC.HN.004 to 008 • 1 specimen; same location, Cau Giay district, residential area; 21.04673°N, 105.80093°E; 9 m a.s.l.; 10 Sep. 2018; H.T. Vu leg.; IEBR.SP.01. • 4 specimens; same location, Ha Dong district, residential area; 20.946386°N, 105.78258°E; 8 m a.s.l.; 5 Dec. 2021; S.X. Le leg.; VRTC.KH.001 to 004 • 1 specimen; same location, Thanh Xuan district, residential area; 20.99984°N, 105.81969°E; 9 m a.s.l.; 6 Jun. 2021; A.D. Nguyen leg.; VRTC.TX.001 • 7 specimens; same location, Tay Ho district, agricultural area; 21.075970°N, 105.83600°E; 12 m a.s.l.; 12 Jan. 2022; S.X. Le and T.T. Do leg.; VRTC.HN.003, VRTC.HN.005 to 008, VRTC.HN.015, VRTC.HN.020 • 1 specimen; same location, Cau Giay district, residential area; 21.069060°N, 105.79577°E; 15 m a.s.l.; May 2023, D.X. Le leg.; VRTC.HN.021. • 1 specimen; Nghe An Province, Pu Mat NP, natural forest; 18.93889°N, 105.23344°E; 437 m a.s.l.; 17 Apr. 2018; S.X. Le leg.; VRTC.PM.033 • 1 specimen; same location, Pu Mat NP, natural forest; 18.95917°N, 104.18347°E; 254 m a.s.l.; 23 Apr. 2018; S.X. Le leg.; VRTC.PM.034. • 4 specimens; Dong Thap Province, Tram Chim NP, natural forest, 10.71746°N, 105.52186°E, 7 m a.s.l., 6 Oct. 2018, D.H. Lam leg.; VRTC.TrC.007 to 009, VRTC.TrC.011 • 1 specimen; same location, Tram Chim NP, natural forest; 10.69942°N, 105.52884°E; 11 m a.s.l.; 18 Mar. 2023; S.X. Le and H.D. Nguyen leg.; VRTC.TrC012 • 1 specimen; same location, Tram Chim NP, natural forest; 10.71075°N, 105.53567°E; 7 m a.s.l.; 20 Mar. 2023; S.X. Le and H.D. Nguyen leg.; VRTC.TrC033.

Diagnosis. Body with 21 leg-bearing segments. LBS 7th with spiracles. Antennae (Fig. 6A) composed of 18–20 articles, of which three basal ones glabrous dorsally. Cephalic plate without lateral and posterior marginations; posterior edge straight, and covered by tergite 1 (Fig. 6A). Tooth-plates with 4(5)+4(5) teeth prominently; trochanteroprefemora of forcipular strong, with 3+4 prominent teeth (one apical and two-three lateral teeth)); coxosternite with short median suture starting from toothplate (Fig. 6C). Tergites (Figs 6B, 7C) without punctate and short median sulcus; lateral margination absent (except for tergite 21, complete); tergites 6–20 with

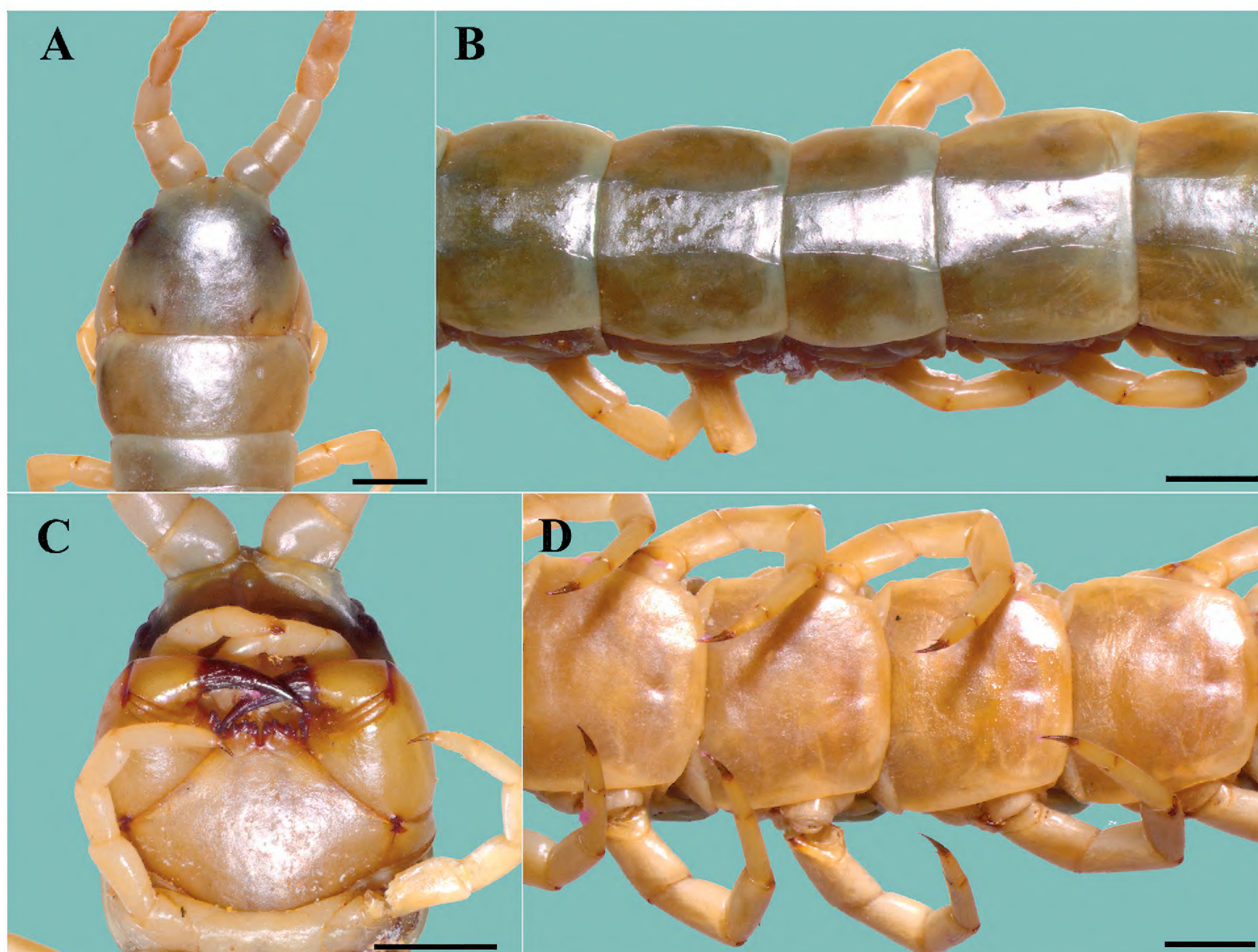


Figure 6. *Rhysida immarginata* (Porat, 1876), TX.142. **A.** Cephalic plate and LBS; **B.** Tergites 7–11; **C.** Head and forcipular segment, ventrally; **D.** Sternites 7–10. Scale bars: 1 mm.

complete paramedian sutures and incomplete on tergites 3–5. Sternites 2–19 with incomplete (only 10–15% length of sternites) paramedian sutures on anterior and posterior parts (Fig. 6D). Coxopleural process with 1(2) apical and 1(2) subapical spine, lateral and dorsal spines absent (Fig. 7B). Leg 1 with 1 femoral, 1 tibial, and 2 tarsal spur(s) (Fig. 7A). Ultimate leg (Fig. 7D) prefemora with 1–2 VL, 0–1 VM, 0–1 M, and 0–2 DM spines.

Remarks. *R. immarginata* is clearly distinguished from other *Rhysida* species in Vietnam by the absence of lateral tergite margination, except for tergite 21. This is also the characteristic supporting the division of *Rhysida* species into two main groups, the *longipes* group and the *immarginata* group, as mentioned in the study of Joshi et al. (2019).

Our examined specimens were consistent with the description in Siriwtut et al. (2018) in most characteristics. However, the descriptions by Siriwtut et al. (2018) do not mention the presence of a median suture on the coxosternite, which we observed to be present, albeit very briefly (Fig. 6C).

Additionally, the length of the antennae reaches the boundary between tergites 5 and 6, which aligns with Siriwtut et al. (2018) and is confirmed by Schileyko and Stoev (2016). This differs from Attems (1930) and Waddock and Lewis (2014), where the antennae are shorter, reaching only the posterior margin of tergite 3, and even shorter in Koch (1985).

Distribution. This species occurs in Africa (Congo, Sudan), South America (Bolivia, Cuba, El Salvador, Guatemala, Peru, Venezuela, and Uruguay), and South and Southeast Asia (Taiwan, Cambodia, Indonesia, Kalimantan, Maluku, Myanmar, the Philippines, Singapore, Sri Lanka, Sumatera, Papua New Guinea, Malaysia, India, Nepal, Thailand, and Laos) (Bonato et al. 2016; Schileyko and Stoev 2016; Siriwtut et al. 2018).

In Vietnam it was recorded in Quang Ninh Province (Ha Long Archipelago) and Nghe An Province (Vinh city) by Attems (1938), and Ha Giang, Dien Bien, Son La, Hoa Binh, Phu Tho, Vinh Phuc, Hai Phong, Thai Binh, Ha Noi, and Dong Thap in this study. The distribution of *R. immarginata* was further updated (Fig. 1).

Rhysida vietnga sp. nov.

<https://zoobank.org/2A2ED8AF-BA2C-4017-82FA-6002D4D62EB1>
Figs 1, 8, 9

Examined materials. Holotype: VIETNAM • 1 specimen; Lao Cai Province, Hoang Lien NP, mixed bamboo forest; 22.4156°N, 103.77778°E; 1,529 m a.s.l.; 15 Apr. 2019; H.D. Nguyen leg.; HLS.064.

Paratypes: • 2 specimens; same location; 22.4156°N, 103.77778°E; 1,529 m a.s.l.; 15 Apr. 2019; S.X. Le & H.D.

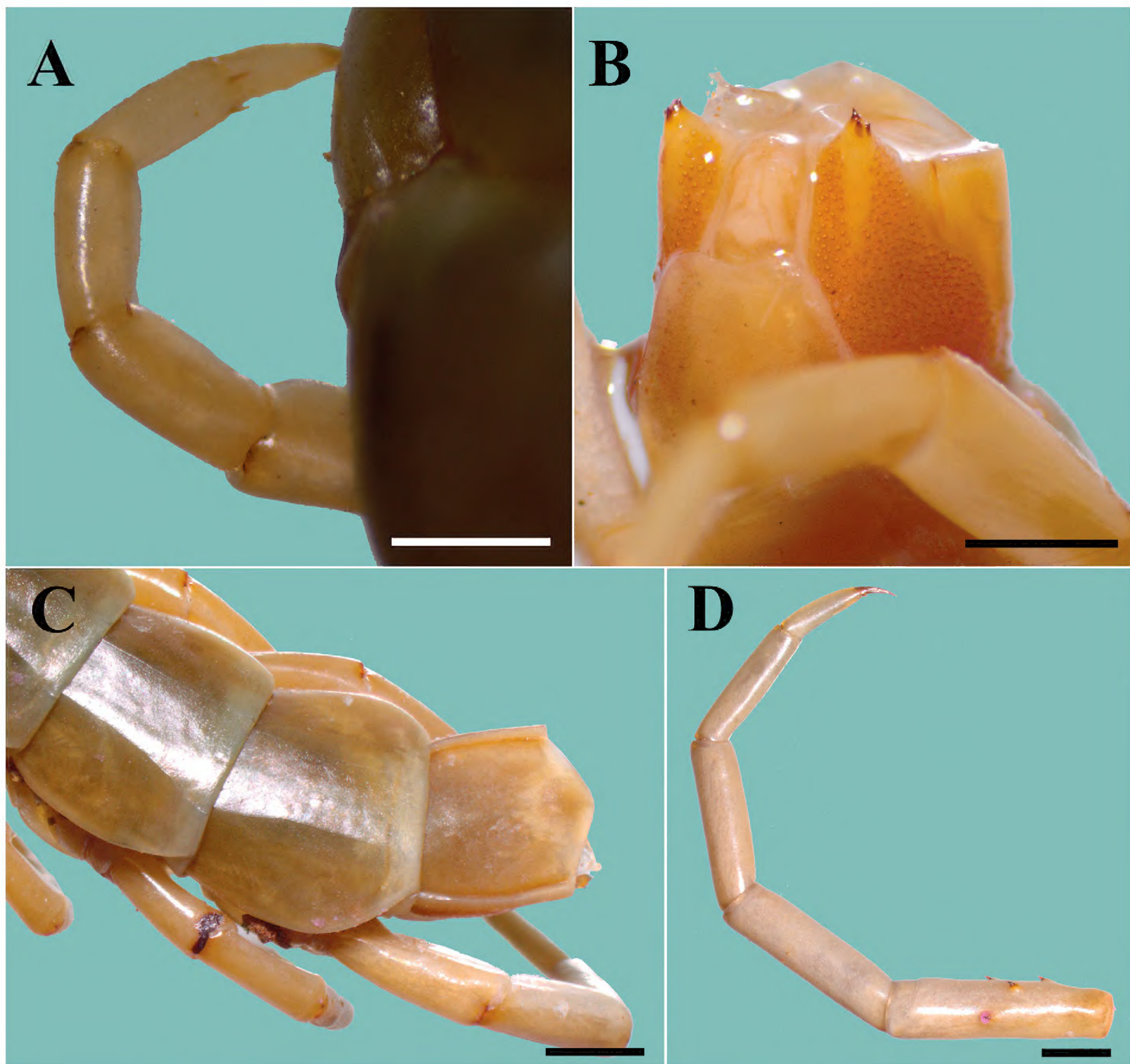


Figure 7. *Rhysida immarginata* (Porat, 1876), TX.142. **A.** First leg; **B.** Last sternites and coxopleuron, ventrally; **C.** Last sternites; **D.** Ultimate leg, ventrally. Scale bars: 1 mm.

Nguyen leg.; HLS.006, HLS.092; • 2 specimens; Son La Province, Ta Xua NR, mixed bamboo forest; 21.35722°N, 104.67333°E; 726 m a.s.l.; 11 Oct. 2017; S.X. Le & H.T. Vu leg.; TX.D4.002, TX.D4.003; 1 specimen • same location; natural forest; 21.35972°N, 104.66972°E; 722 m a.s.l.; 30 May 2018; H.D. Nguyen leg.; TX.258.

Diagnosis. Body with 21 leg-bearing segments. LBS 7th with spiracles. Antennae composed of 18 articles, of which three basal ones glabrous dorsally. Tooth-plate with five short teeth. Tergites with lateral marginations and 5–7 keels and many spinulations scattered on tergites, more obvious in the posterior tergites, without complete paramedian sutures. Sternites with paramedian suture incomplete on anterior part (on some sternites). Coxopleural process with 2 apical, 1 lateral spines and without dorsal spine.

Description. Body length 58 mm. Antennae composed of 21 articles, of which three basal ones glabrous dorsally, following segments densely covered by minute setae (Fig. 8A, B). Antenna length reaching to 6th body segment.

Cephalic smooth, without puncta and setae; lateral and posterior margination absent, the posterior border adjacent to anterior border of tergite 1. Four big ocelli present, nearly equal in size. The median suture on the top of cephalic plate long, shallow (Fig. 8A).

Forcipular segment (Fig. 8B), coxosternite, trochanteroprefemora, and the basal part of tarsungulae smooth, without punctate and setae; coxosternite without median suture. Tooth-plates slightly wider than high and nearly semicircular, with 5 short teeth and well chitinized; the distance between the tooth-plates wide; each tooth-plate with straight, transverse basal suture. Forcipular trochanteroprefemoral process bearing 3 short denticles, the latter being indistinct, position of denticles higher than tooth-plates. Maxillae with sparse short setae, and segment 2 of second maxillary telopodite with spur; chitin-line very short.

Tergites with very small punctae; lateral margination incomplete on tergites 9–20 and complete on tergite 21; paramedian sutures absent on all tergites; tergites 1–7

smooth, and tergites 8–20 with 5–7 keels and many spinulations which scattered on tergites, more obvious in the posterior tergites; tergite of ultimate leg-bearing segment sub-quadrangular and convex posteriorly (Figs. 8D, 9A).

Sternite surface smooth (without punctae), lacking any median sulci. Sternites shield-shaped, last sternite trapezoid (or nearly triangular). Incomplete paramedian suture on anterior part of some sternites (<10% of their width) or absent, lacking depression (Figs 8B, C, 9B).

Coxopleuron densely covered by pores (except the apical part); coxopleural process with 2 apical and 1 lateral spine, without dorsal spine (Fig. 9B).

Locomotory legs usually bearing small, short setae; legs 1–4 with 1 tibia spur, legs 1–18 with 2 tarsal spurs, 19–20 with 1 tarsal spur. Ultimate legs very thin and long; the ratio of lengths of prefemur, femur, tibia, tarsus 1, and tarsus 2 as follows: 2.8:2.7:2.5:2.0:1.0; ratio of length and width of prefemur 6:1. Prefemoral spines on ultimate leg: 4 VL, 3 VM, 3 M, and 1 DM spines; prefemoral process of ultimate legs very short with 1 spine; all of segment smooth (Fig. 9C).

Variations. Body length reaches a maximum of 66 mm (TX.D4.002). Specimens from Ta Xua NR (Son La) show that the lateral margination starts from tergite 5 (TX.258) or tergite 6 (TX.D4.003). The keels on the

tergites from specimen TX.D4.002 present on tergites 12–20. Locomotory legs with tibia spines from legs 1–4 or legs 1–6 (HLS.092). Prefemoral spines on ultimate leg can have 3–4 VL, 2–3 VM, 3–4 M, and 1–4 DM spines.

Etymology. The species name is named after the Joint Vietnam-Russia Tropical Science and Technology Research Center (VRTC), an institution that has significantly contributed to biodiversity research in Vietnam.

Remarks. The new species differs from *R. immarginata* in the clearly visible but incomplete lateral margins on the tergites (absent in *R. immarginata*, except for tergite 21). The absence of a paramedian suture on the sternites is a distinguishing feature that separates the new species from *Alluopus calcaratus*. *Rhysida vietnga* sp. nov. is distinguished from *R. longipes* and *R. lithobioides* by the presence of keels on the tergites. This is also a character to distinguish the new species and its congeners.

Rhysida vietnga exhibits morphological similarities to *Rhysida singaporensis* Verhoeff, 1937, particularly in the distinctive structure of the dorsal plate with keels. This characteristic also distinguishes these two species from other members of the genera *Rhysida* and *Alluopus*. Therefore, a morphological comparison between the new species *R. vietnga* and *R. singaporensis* is most

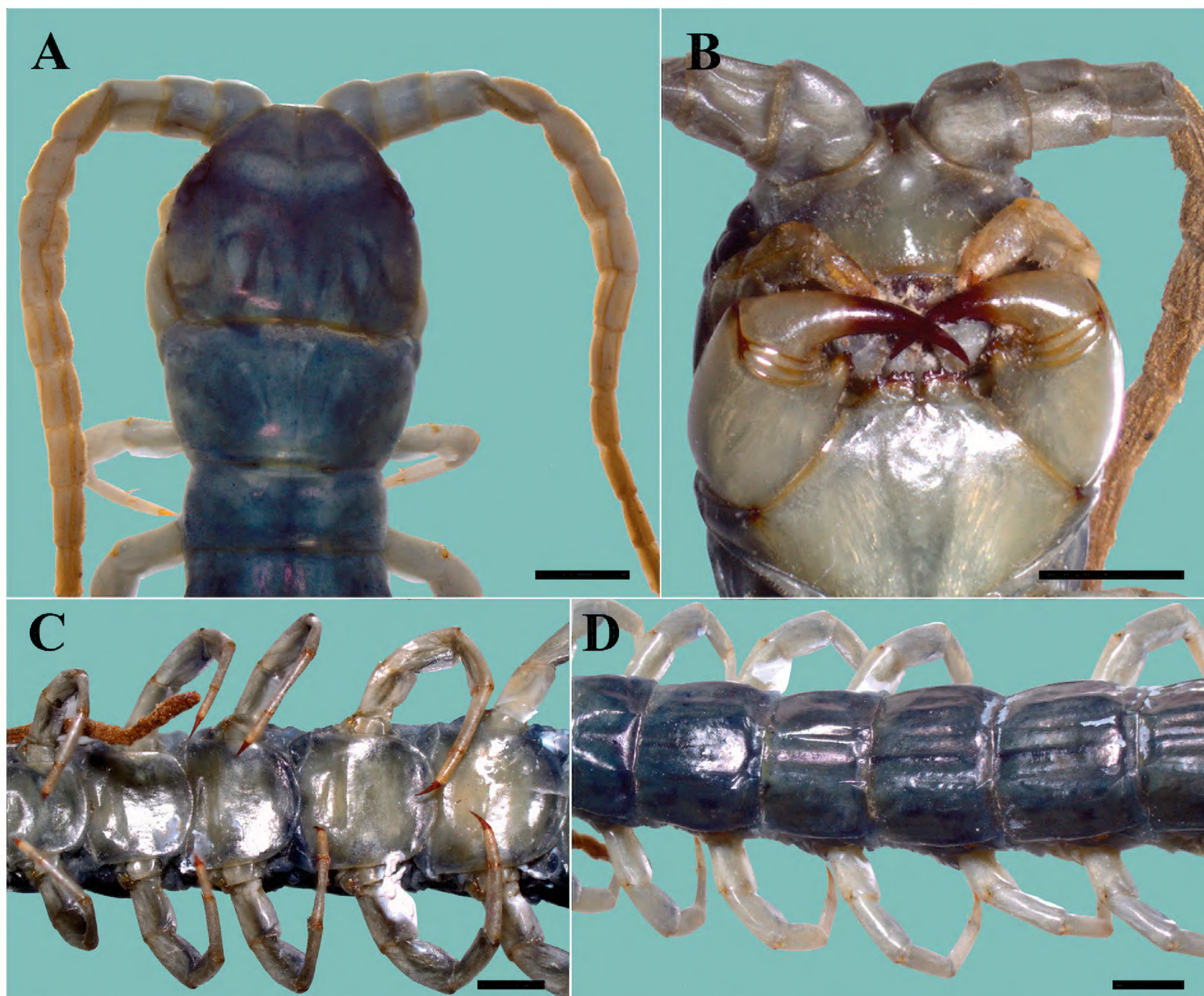


Figure 8. *Rhysida vietnga* sp. nov., holotype, HLS.064. **A.** Cephalic plate and LBS; **B.** Head and forcipular segment, ventrally; **C.** Sternites 6–10; **D.** Tergites 6–10. Scale bars: 1 mm.

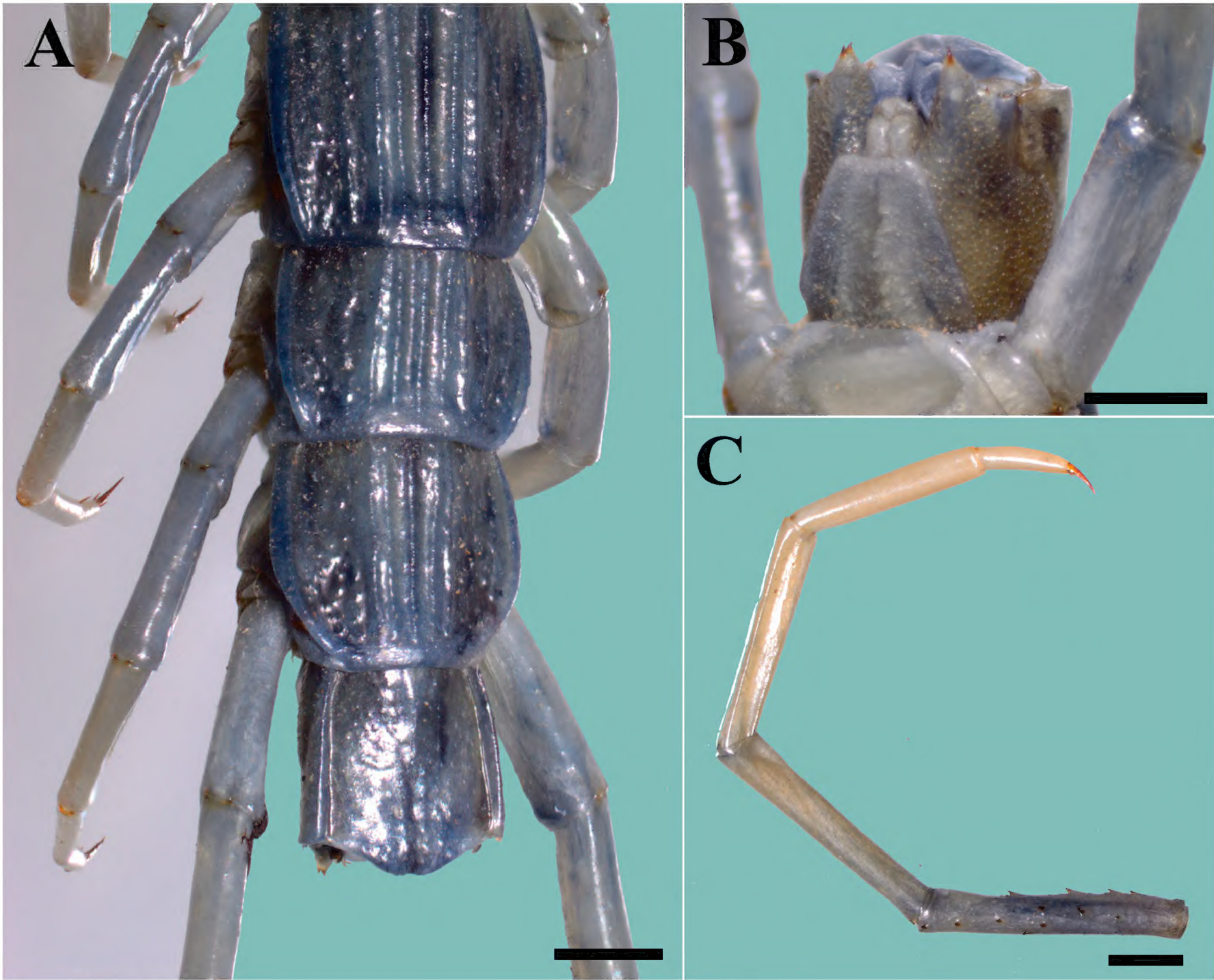


Figure 9. *Rhysida vietnga* sp. nov., holotype, HLS.064. **A.** Tergite of ultimate leg-bearing segment; **B.** Coxopleuron, ventrally; **C.** Ultimate leg. Scale bars: 1 mm (**A**, **C**); 0.5 mm (**B**).

appropriate. The distinction between these two species can be made based on the following characters: The new species, based on six specimens examined in this study, is markedly smaller than *R. singaporensis*, with a maximum body length of 66 mm and an average of 43 mm, whereas *R. singaporensis* typically ranges from 73 to 89 mm in length. According to descriptions of Lewis (2001) and Siriwt et al. (2018), *R. singaporensis* has a median keel on the tergites, while the lateral longitudinal keels are either not mentioned or described as short (incomplete); if present, longitudinal keels end with numerous spines. However, the illustrations in these studies do not show the presence of complete longitudinal keels. In contrast,

R. vietnga has 5–7 distinct, complete longitudinal keels on tergites 8–20 (similar to those of *Otostigmus scaber*; see Lewis 2001, p. 26, fig. 49), along with abundant spinulation scattered across the tergites, which becomes more pronounced on the posterior tergites (Fig. 9A). The comparative morphological data for Southeast Asian species are summarized in Table 1.

In addition, *R. singaporensis* is distributed in the archipelagic region, likely limited to the Malay Archipelago, while *R. vietnga* is found in the mainland area of the Indochina Peninsula.

Distribution. Only known in Lao Cai province and Son La province in Vietnam (Fig. 2).

An identification key to species of *Rhysida* and *Alluopus* in Vietnam

- 1 Sternites with complete paramedian sutures, lateral margination starting from tergite 12(13)..... *Alluopus calcaratus* (Genus *Alluopus*)
- Sternites without complete paramedian sutures 2 (Genus *Rhysida*)
- 2 Tergites with 5–7 longilateral keels and many spinulations which scattered on tergites, more obvious in the posterior tergites; Ultimate legs very thin and long, ratio of length and width of prefemur 6:1 *Rhysida vietnga* sp. nov.
- Tergites without longilateral keels and spinulations Ultimate legs very thin and moderately long, ratio of length and width of prefemur 4:1 3
- 3 Tergites without lateral marginations (except ultimate tergite), 2 tarsal spurs on legs 1–13(18) *Rhysida immarginata*
- Tergites with lateral marginations, 2 tarsal spurs on legs 1–7(8) *Rhysida longipes*

Table 1. The comparative morphological data for East Asian species of *Alluropus* and *Rhysida*.

No	Characters	<i>A. calcaratus</i>	<i>R. immarginata</i>	<i>R. longipes</i>	<i>R. singaporensis</i>	<i>R. lithobioides</i>	<i>R. vietnga</i> sp. nov.
1	Maximal body length (mm)	52	81	73	89	65	66
2	The number of antennal articles	18–21	17–20	16–18	19–21	16–19	21
3	Basal antennal glabrous	3	2.8–3	2.8–3	3	3	3
4	Number of teeth per tooth-plate	4	4–5	4–5	5–7(8)	4–5	5
5	Paramedian suture on tergites	3–19(20)	4(6)(12)–20	4(5)–19	From 2(3)	From 4(5)	Absent
6	Lateral margination on tergites	12(13)–21	Only tergite 21	6(10)–21	From 7(9)	From 8(9)	5(9)–21
7	Keels on tergites	absent	absent	absent	Median keel	absent	5–7 longitudinal keels
8	Paramedian suture on sternites	Complete	Incomplete (< 20%)	Incomplete (< 20%)	Incomplete (10–25%)	Incomplete (10–35%)	incomplete (<10%) on some sternites
9	Coxopleuron spines	1(2) apical, 1(2) subapical, 1 lateral, 0(1) dorsal	1–2 apical, 1–2 subapical, no lateral and dorsal	2 apical, 1 subapical, and 1 lateral, no dorsal	2 apical, 1(0) subapical, and 1 lateral, no dorsal	2 apical, no lateral and dorsal	2 apical, and 1 lateral, no dorsal
10	Prefemur spur on leg 1	Present	Absent	Absent	Absent	Absent	Absent
11	tibial spur on legs	1–3(4)	1–2(3)	1–3(8)	1–2(3)	1–5	1–4(6)
12	Tarsal spur	2 on legs 1–8(17), and 1 on subsequent legs to leg 19(20).	2 on legs 1–13(18), and 1 on subsequent legs to leg 19.	2 on legs 1–7(8), and 1 on subsequent legs to leg 19.	2 on legs 1–18, and 1 on subsequent legs to leg 20..	2 on legs 1–5, and 1 on subsequent legs to leg 20.	2 on legs 1–18, and 1 on subsequent legs to leg 20.
13	Number of prefemoral spines on the ultimate legs	4–6VL, 2–4VM, 0–6M, 1–4DM, 2–7CS	1–2VL, 0(1)VM, 0–1M, 0–2DM, 0CS	2–4VL, 2–5VM, 0–1M, 1–3DM, 0–2CS	1VL, 0(1)VM, 0–2M, 1DM, 0–1CS	1–3VL, 1–3VM, 0–2M, 1–3DM, 1CS	3–4VL, 2–3VM, 3–4M, 1–4DM, 1CS
14	Ratio between the length and width of prefermur	4.5 : 1	4 : 1	4 : 1	No data	No data	6 : 1

Data sources: Lewis (2001), Siriwut et al. (2018), and Joshi et al. (2019).

Conclusion

Our study has provided updates on two centipede genera, *Alluropus* and *Rhysida*, within the context of Vietnam’s fauna, with four species: *Alluropus calcaratus*, *Rhysida immarginata*, *Rhysida longipes*, and a new species, *Rhysida vietnga* sp. nov. The diversity of centipedes of two genera is potentially greater, but this is reflected by insufficient sampling. To achieve a more complete understanding of the biodiversity and geographic distribution of these species, further comprehensive surveys are necessary.

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